Proviso with pseudowords

Introduction

The proviso problem is a problem of *non-uniformity* in presupposition projection: presuppositions of elementary clauses are sometimes inherited wholesale when the clause is embedded under a truth-conditional operator (1), but sometimes, the presuppositions associated with complex seem to be weaker than those of its simplex constituents (2a).

(1)   Sam didn't bring his guitar.
        —> Sam has a guitar.

(2)   a. If Sam is a musician, he will bring his guitar to the party.
        —> If Sam is a musician, he has a guitar.
        b. If Sam is tired, he will bring his guitar to the party.
        —> Sam has a guitar.

In particular, the presupposition associated with (2a) seems to be of a *conditionalized* form, yet the one associated with (2b), whose sentence takes a similar form than (2a), is a non-conditional inference. The conditional inference in (2a) is predicted by various theories of projection, which either encode this projection behavior (i) directly as a lexical property of connectives (e.g. Heim 1983), (ii) a consequence of the way presupposition failure is repaired within trivalent system (George 2008, Fox 2008), or (iii) a consequence of how contexts evolve over the course of evaluating a complex sentence (Karttunen 1974, Soames 1982, Schlenker 2009, 2011). Within dynamic accounts, a standard response to the strengthened, non-conditional inference we obtain in (2b) is to supplement the existing system of presupposition projection with a strengthening mechanism.

As Singh (2007, 2008) and Schlenker (2011) point out, the proviso problem can be decomposed into two subproblems that can be tackled separately. More specifically, any complete theory of presupposition projection should be equipped with mechanisms to generate both conditional and non-conditional inferences, and also it should be able to predict which inference obtains when:

(3)   **The Strengthening Problem**: How are the different inferences generated?
        The Selection Problem: How is the inference that actually obtains selected?

While the details of how the strengthening mechanism is implemented vary across different accounts, there is a widely shared intuition that the (un)availability of a strengthened reading is regulated by some notion of **(in)dependence** or **(ir)relevance**: specifically, what distinguishes (2a) from (2b) is that in (2a), p and q are dependent, since our world knowledge tells us that someone who is a musician is likely to have a guitar; in (2b), p and q are not obviously dependent or related to each other, since someone being tired generally has no bearing on whether or not they should have a

guitar. Generalizing from this contrast in (2a-b), for any conditional statement that takes the form *if p then qq*, with *q* being the presupposition in the consequent clause, the strengthening mechanism kicks in and delivers a non-conditional inference if *p* and *q* are independent.[1]

While (in)dependence is often recruited in developing the strengthening mechanism, its notion is not always explicitly defined. Two notions of (in)dependence that have been fleshed out in recent work are van Rooij's (2007) *qualitative* definition, which is based on entailment by input context, and Lassiter's (2012) (and to a lesser extent maybe Schlenker's (2011) too) *probabilistic* definition. It is not clear how, if at all, the two notions can be teased apart empirically, and this is not our goal; as Mandelkern & Rothschild (2018) points out, there is a sense in which qualitative independence is the corollary of probabilistic independence in a qualitative framework. The motivation of our study, to put briefly, is that while we know that *some* notion of independence plays a role behaviorally— based on our intuitions, and an existing study which we briefly discuss below — what underlies this behavioral signature remains much less understood. Is it part of the grammar, which follows from the logic of presupposition projection in conditionals given our semantic theory, or is it primarily post-semantic reasoning based on world knowledge about other people's information states and commitments?

Our goal then, is precisely to divorces issues of world knowledge and plausibility considerations from the interpretation of conditionals, which we hope will give us a real shot at understanding what is the semantic presupposition of these sentences. By doing so, we can focus on the presupposition projection aspect of the problem. Looking forward, the questions we will be interested in include:

- What is the semantic presupposition projected out of conditionals that take the form of *if p then qq*, if we take away world knowledge considerations from these sentences?
  - If we introduce independence in such a way, do we still obtain strengthened inferences? Or does non-uniformity disappear?
  - That is, do linguistic structures suffice to guarantee strengthening?
- Mayr & Romoli (2016) analyzes the proviso problem as a matter of truth conditional ambiguity. In particular, they treat the strengthened inference as the result of a biconditional derived from *exh* applying to the plain conditional. This provides testable predictions within the current agenda:
  - Do explicit biconditonals give rise to uniform non-conditional inferences?
  - If we place plain conditionals in an environment that blocks *exh*, do we uniformly get conditional inferences? ("*It is not the case that if p then qq*")
- Different projection environments?
  - Conditionals vs. disjunction: no predicted difference?
  - Factives

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[1] Note that this is not entirely accurate, given what Lassiter (2012) noted about cases of deprobabilization, i.e. pr(q|p) < pr(q), where the felt presupposition is unconditional even though the crucial independence assumption is clearly not appropriate. However, this suffices for our present purpose, so I set the deprobabilization cases aside for now.

Existing work

To our knowledge, there has been one published work that attempts to systematically investigates the role of (in)dependence in the proviso problem. Romoli, Sudo, & Snedeker (2012) tested the hypothesis that the conditional inference $p \rightarrow q$ is more likely to arise when the presupposition q in the consequent is *dependent* on the antecedent p. The experimental materials in Romoli et al include two critical conditions, **Dependent** and **Independent**, which was determined by results from a separate norming study where participants were given a statement about a monster and were asked whether that statement made it more or less likely that the monster possessed a particular property (*e.g. Googlemorph is flying. Does that make it more likely that he has wings?*). The eight items with the highest scores are used to construct the critical items of the **Dependent** condition, and the eight items whose scores were the *closest to the middle point 2.5* were used to construct the critical items in the **Independent** condition. Notice that this decision already allowed for the possibility that in the **Independent** condition, there was still room for speculating a dependence relation, albeit perhaps a somewhat weak one.

In a picture selection task (Exp 1), participants were asked read sentences and pick a picture that best matches what the sentences say. The target and control trials involve conditional sentences with a possessive noun phrase. They are followed by either a confirmation of the antecedent (control trials) or a denial of the antecedent (critical trials):

(4)   **Dependent**
       If Googlemorph is flying, then his wings are big and strong.
       a. And Googlemorph is flying.   (Control)
       b. But Googlemorph is not flying.   (Critical)
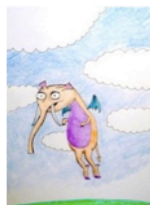
(5)   **Independent**
       If Googlemorph is drinking orange juice, then his wings are big and strong.
       a. And Googlemorph is drinking orange juice.   (Control)
       b. But Googlemorph is not drinking orange juice.   (Critical)
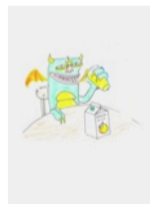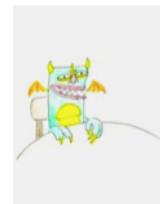
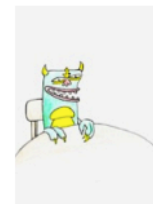| (A) : TTT	(B): TTF	(C): FTF	(D): FF-

| (A) : TTT	(B): TTF	(C): FTF	(D): FF-

Each item has four pictures, which depict the following four monsters: (A) a monster (TTT) that satisfies all of the antecedent, **the non-conditional presupposition** and the consequent; (B) a monster (TTF) that satisfies the antecedent and **the non-conditional presupposition** but not the consequent; (C) a monster (FTF) that does not satisfy the antecedent, **satisfies the non-conditional presupposition** and does not satisfy the consequent; and (D) a monster (FF-) that **does not satisfy the antecedent or presupposition** (and as a result the consequent is undefined).

Romoli et al predicts that in the critical trials, the antecedent *p* of the conditional *if p, then qq* is denied by the second sentence *not-p*, which makes the pictures (A) TTT and (B) TTF incompatible with the sentences. Crucially, if the conditional sentence has **a non-conditional inference q**, the picture **(C) FTF** is the only compatible choice, while if it has a **conditional** inference $p \to q$, **both** (C) FTF and (D) FF- are compatible with the sentences. Under the hypothesis that conditional inferences are more likely when the presupposition of the consequent is dependent on the antecedent, **(D) FF-** is predicted to be chosen more often in the **Dependent** condition than in the Independent condition.
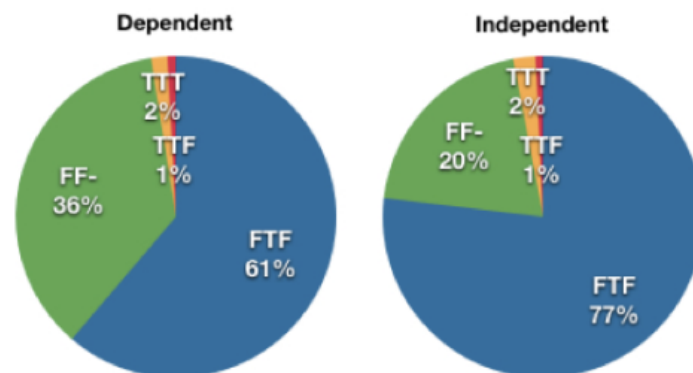
As predicted, (D) FF- was chosen significantly more often in the Dependent condition than in the Independent condition. Moreover, in both conditions, (C) FTF was chosen more often than (D) FF-. These results suggest that participants are **more likely to make conditional inferences when the presupposition is dependent** on the antecedent. The preference for **(C) FTF** might seem to suggest that the non-conditional inference was preferred in both conditions — this rests on the assumption that participants who arrived at a conditional inference would consistently select FF-. **But the conditional inference is in principle compatible with both FF- and FTF.** Therefore, **while it is certain that a selection of (D) FF- is due to the conditional inference, there is no direct way to know whether (C) FTF is due to a conditional inference or non-conditional.**

To address this concern, they also conducted a covered box task (Exp 2), where one of the pictures is covered and cannot be seen. In the critical trials of Exp 2, (C) FTF is covered. Given that the non-conditional inference is only compatible with this picture, while the conditional inference is compatible with both (C) FTF and (D) FF-, they expect that whenever the non-conditional inference arises, the covered picture will be selected;

furthermore, whenever the conditional inference arises, (D) FF- will be selected. The results were consistent with those from Exp 1: (D) FF- was chosen significantly more often in the Dependent condition than in the Independent condition. In addition, (D) FF- was selected more often than the covered box in both conditions
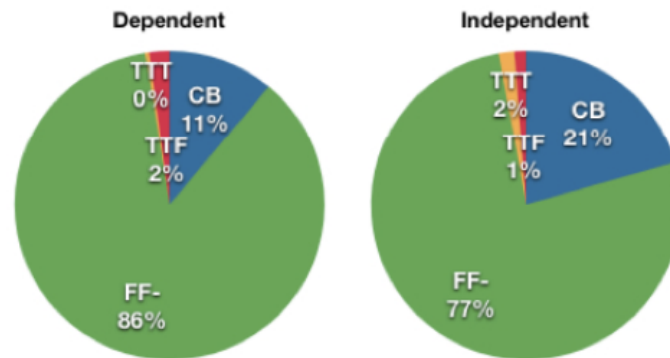
The results from Romoli et al suggested that (in)dependence played some role in participants' selection of the inferences that they would endorse for conditional statements like *if p then qq*. In particular, in the covered box task, the conditional inference was available in both Dependent and Independent conditions: there is a substantial amount of endorsement for (D) FF- in the Independent condition, suggesting that the conditional inference is also available there. This could be due to the nature of covered box task: the general pragmatic consideration that selects the stronger inference (i.e. the non-condional inference *q*) is not observable here, because the selection mechanism is suspended. Thus this is no necessarily incompatible with independence-based accounts which invokes the same consideration to account for selection/preference.

Motivation

As we mentioned, our introspection of the proviso sentences and the experimental results reported in Romoli et al consistently indicate that (in)dependence does play a role in modulating the availability of the strengthened reading. What has not been answered in this line of work is the following: is it the grammar (following the logic of presupposition projection in conditionals given our theories) or post-semantic reasoning based on world knowledge that underlies the (in)dependence consideration in our assessment of the inferences that arise from the proviso sentences?

Neither our intuition of the classic proviso sentences, nor the results in Romoli et al, can answer this question. To elaborate on the latter, the experimental materials used in Romoli et al were selected from a norming study, and the items that were included in the Independent condition of their subsequent experiments received a rating of around 2.5 on a scale from 0 to 5 in terms of the relatedness of the antecedent *p* and the presupposition *q*. This property of their materials inherently determined that the (in)dependence manipulation was still muddled by participants' world knowledge,

affecting in particular the Independent condition in which the strengthened reading would potentially surface. In addition, this also has important consequences for their experimental results, because the possibility of postulating a dependency relation between p and q in their design would necessarily lead to an *overestimation* of the conditional inferences, and consequently an *underestimation* of the non-conditional inference, in the Independent condition.

In order to divorce issues of world knowledge and plausibility considerations from the interpretation of conditionals, we propose a study in which key lexical items in the proviso sentences are substituted with pseudowords, which we hope will give us a real shot at understanding what is the semantic presupposition of these sentences.

Proposed study (and a pilot)

We create a paradigm that uses only pseudowords to manipulate the (in)dependency between p and q. There is one control condition and three critical conditions:
  (1) **Control**: p and qq. There is a relation between p and q which doesn't matter.
  (2) **Independent**: *if p then qq*, and there is no relation between p and q;
  (3) **Dependent**: *if p then qq*, and an explicit statistical relation between p and q are provided in the context;
  (4) **FullDep**: *if p then qq*, and p and q are fully correlated such that *if p then q* must be true, and vice versa.

Materials & Workflow:
  • Include only <u>1 trial</u> for each condition: saving time + money.
  • Order of presentation: **Control**, then **Independent**, **Dependent**, **FullDep**.
    • Control as a practice item (also for filtering participants)
    • All different pseudowords, to avoid cross-trial contamination

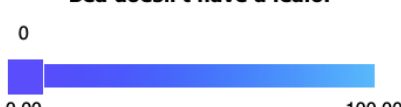Participants: 22 volunteers from social media.

Instruction:

> You will read 4 different stories about aliens from different planets, far away from the Earth, and a statement characterizing an individual from each of those planets.
> Afterwards, you will receive two new pieces of information, **one at a time**. Given what you were already told about the aliens, how **surprised** would you be to learn each of these new pieces of information?
> For example, suppose you had previously been told that "Katie recently got divorced". You might be *very surprised* if you later found out that she had never been never married, but *not surprised* at all to learn that Katie was unhappy with her marriage.
> Your job is provide a rating for the statements on a scale **from 0 to 100**, with 0 being not surprised at all and 100 being totally surprised.

Trial	Q1: q?	Q2: p?
Control	Eva is an alien from this planet. Here, some aliens are fleppers and some aliens are not fleppers. Most of the fleppers have a lammor. **Eva is a flepper, and she has a lammor.** *How surprised would you be if you learned that …?* **Eva doesn't have a lammor.** 0 0.00 100.00 Continue	Eva is an alien from this planet. Here, some aliens are fleppers and some aliens are not fleppers. Most of the fleppers have a lammor. **Eva is a flepper, and she has a lammor.** *How surprised would you be if you learned that …?* **Eva is a flepper.** 0 0.00 100.00 Continue
Independent	Ann is an alien from this planet. Here, some aliens are glorps and some aliens are not glorps. Some of the aliens have dords, but it doesn't matter whether they're glorps or not. **If Ann is a glorp, she will yapple her dord.** *How surprised would you be if you learned that …?* **Ann doesn't have a dord.** 0 0.00 100.00 Continue	Ann is an alien from this planet. Here, some aliens are glorps and some aliens are not glorps. Some of the aliens here have dords, but it doesn't matter whether they're glorps or not. **If Ann is a glorp, she will yapple her dord.** *How surprised would you be if you learned that …?* **Ann is a glorp.** 0 0.00 100.00 Continue
Dependent	Bea is an alien from this planet. Here, some aliens are morties and some aliens are not morties. Half of the morties have a lealo. No one else has lealos. **If Bea is a mortie, she will wegget her lealo.** *How surprised would you be if you learned that …?* **Bea doesn't have a lealo.** 0 0.00 100.00 Continue	Bea is an alien from this planet. Here, some morties and some aliens are not morties. Half of the morties have a lealo. No one else has lealos. **If Bea is a mortie, she will wegget her lealo.** *How surprised would you be if you learned that …?* **Bea is a mortie.** 0 0.00 100.00 Continue

| FullDep | Cece is an alien from this planet. Here, some aliens are gogopos and some aliens are not gogopos.

All gogopos have a hoopler. No one else has hooplers.

If Cece is a gogopo, she will dippefy her hoopler.

How surprised would you be if you learned that ...?

Cece doesn't have a hoopler.

0

0.00   100.00

[Continue] | Cece is an alien from this planet. Here, some aliens are gogopos and some aliens are not gogopos.

All gogopos have a hoopler. No one else has hooplers.

If Cece is a gogopo, she will dippefy her hoopler.

How surprised would you be if you learned that ...?

Cece is a gogopo.

0

0.00   100.00

[Continue] |
|---|---|---|

The logic of the task:
- If we are still able to induce the effect of independence on strengthening after removing world knowledge and plausibility considerations, then we should expect a difference between Independent and Dependent/FullDep on the rating measures. More specifically, the question "how surprised would you be…" probes the participants' commitment to the non-conditional inference in the context: if they think *q*, then they will be more surprised to learn later that *not-q*. The more surprised they are to the new statement *not-q*, the more committed they were to q in the context.

What we predict:
- In the Independent condition, *p* and *q* are unrelated. If the inference has been strengthened to a non-conditional one, then participants will add to the context *q*. If so:
  - They should be more surprised to learn later that *not-q*.
  - They should also be more surprised to learn *not-q* than *not-p* within this condition.
- On the other hand, if independence does not lead to strengthening of the inference, then participants will only commit to a conditional inference *if p then q*. In that case,:
  - We should observe similar ratings for how surprising people are upon learning *not-q* across the different critical conditions;
  - The ratings for *not-q* will be similar to the ratings for *not-p*.

How our experiment relates to the theoretical question at hand:
- If our predictions are born out, it will suggest that the role of independence on strengthening remains operative even when we remove world knowledge considerations. It is the grammar — following the logic of presupposition projection in conditionals given our theories — that underlies the (in)dependence consideration in our assessment of the inferences that arise from the proviso sentences.

Results: see **proviso_20201116.pdf**

A possible follow-up: Testing for asymmetry?

Antecedent: If John brings his dord, he will be very busy.
　　　　　　-/-> If John is a glorp, then he has a dord
　　　　　　—> John has a dord.

vs.

Consequent: If John is a glorp, he will bring his dord.
　　　　　　—> If John is a glorp, then he has a dord
　　　　　　—> John has a dord.